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(54) **SYSTEM AND METHOD FOR AUTOMATED PARKING**

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(52) **U.S. Cl.** **340/932.2**; 340/905; 340/928; 340/995; 340/937; 340/933; 340/906; 340/991
(58) **Field of Search** 340/932.2, 905, 340/928, 995, 937, 933, 904, 991

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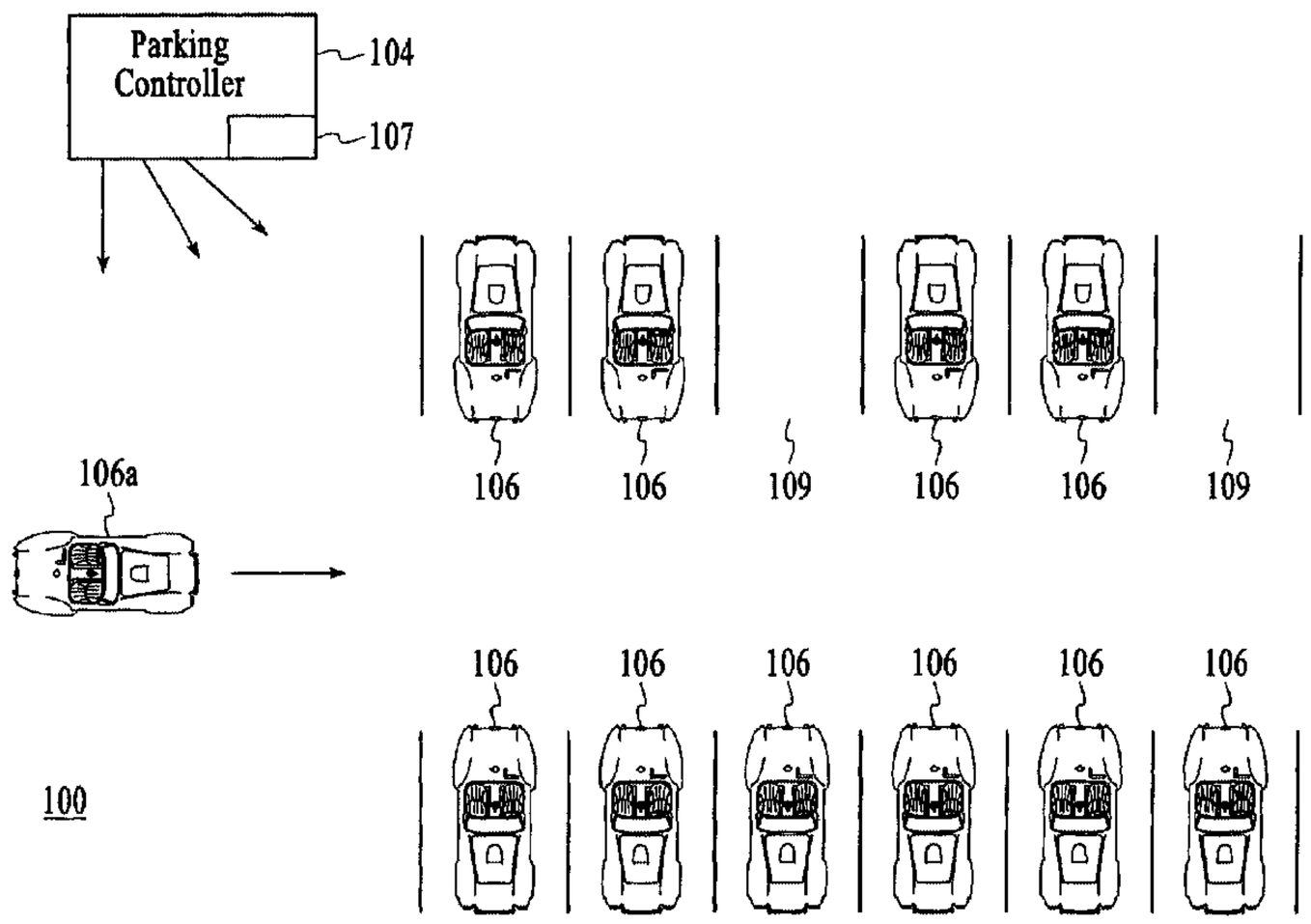
(57) **ABSTRACT**

A parking control system is disclosed. The parking control system comprises a plurality of vehicles. A portion of the plurality of vehicles occupies parking spaces in a parking lot. At least one of the vehicles is attempting to park in a parking space of the parking lot. At least one of the plurality of vehicles is capable of a two-way communication. The parking control system also includes a parking controller. The parking controller receives and provides information to the plurality of vehicles. The parking controller can communicate the most appropriate parking space to the vehicle that is attempting to park. In a method and system in accordance with the present invention, a parking controller monitors a parking lot and can be in direct contact with the vehicles. The parking controller receives and transmits information to and from the vehicles and allows for an overall view of the parking lot to be understood. Accordingly, through the use of the parking controller system, parking is controlled more accurately and automatically.

37 Claims, 7 Drawing Sheets



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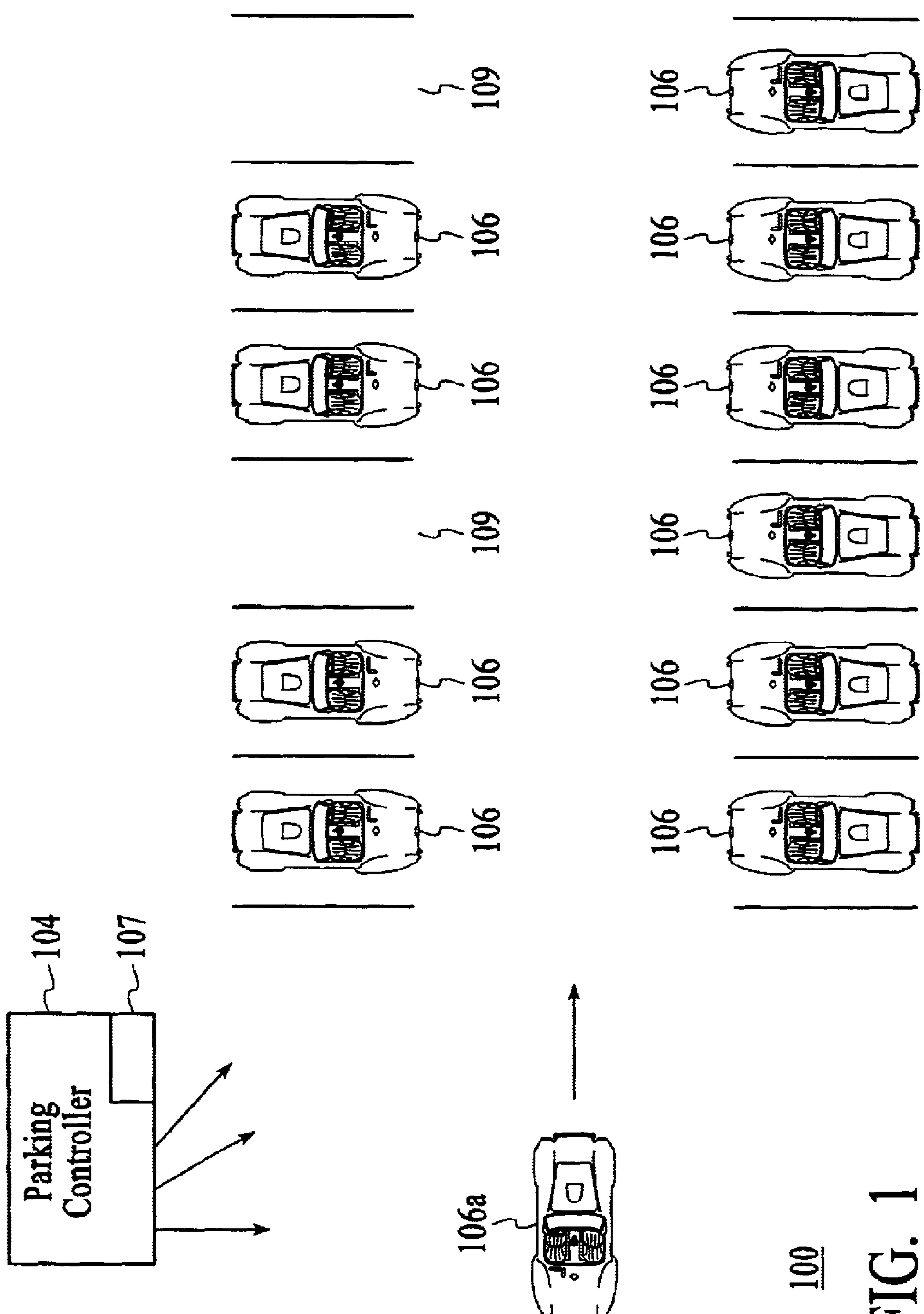


100
FIG. 1

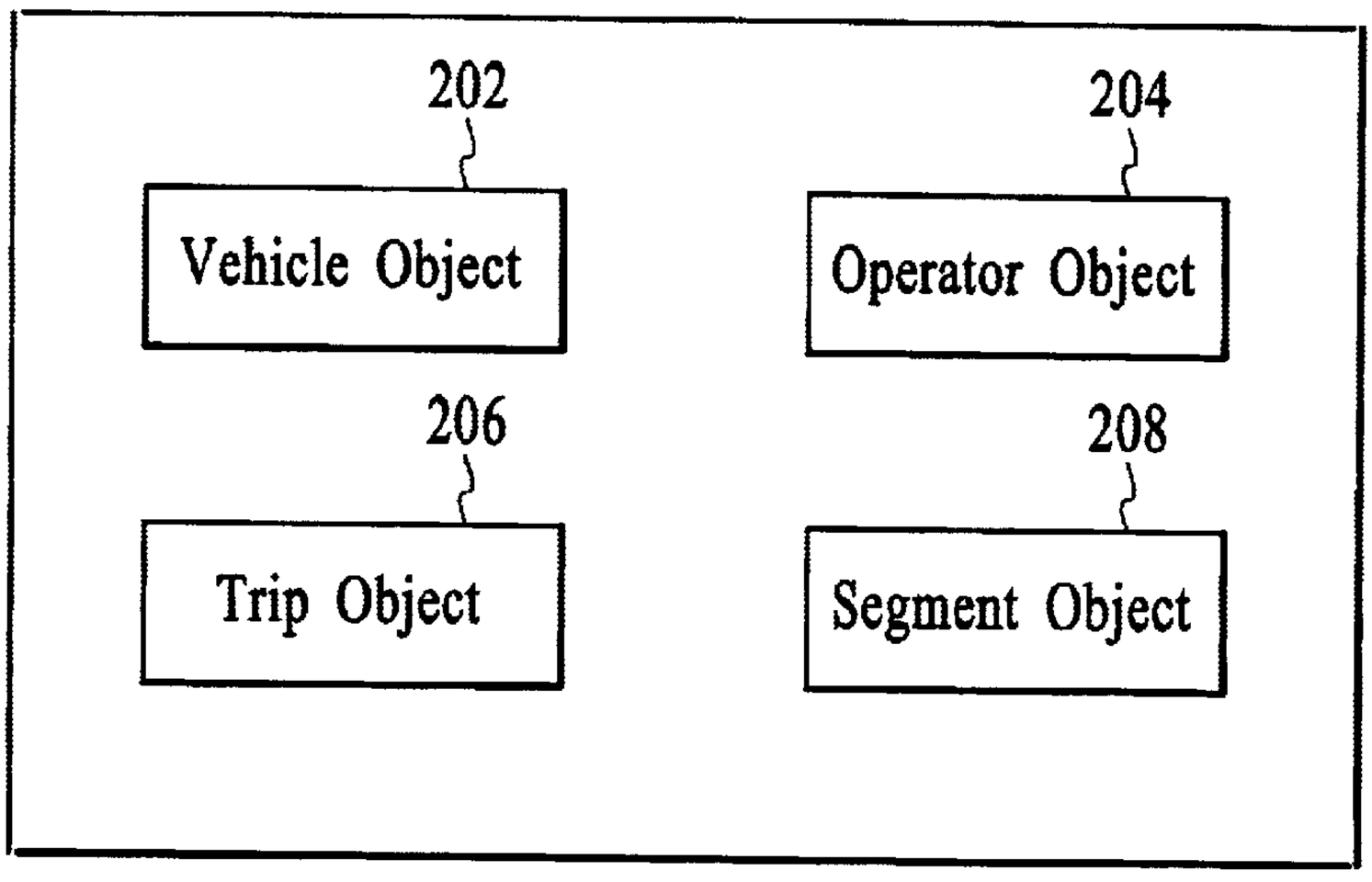
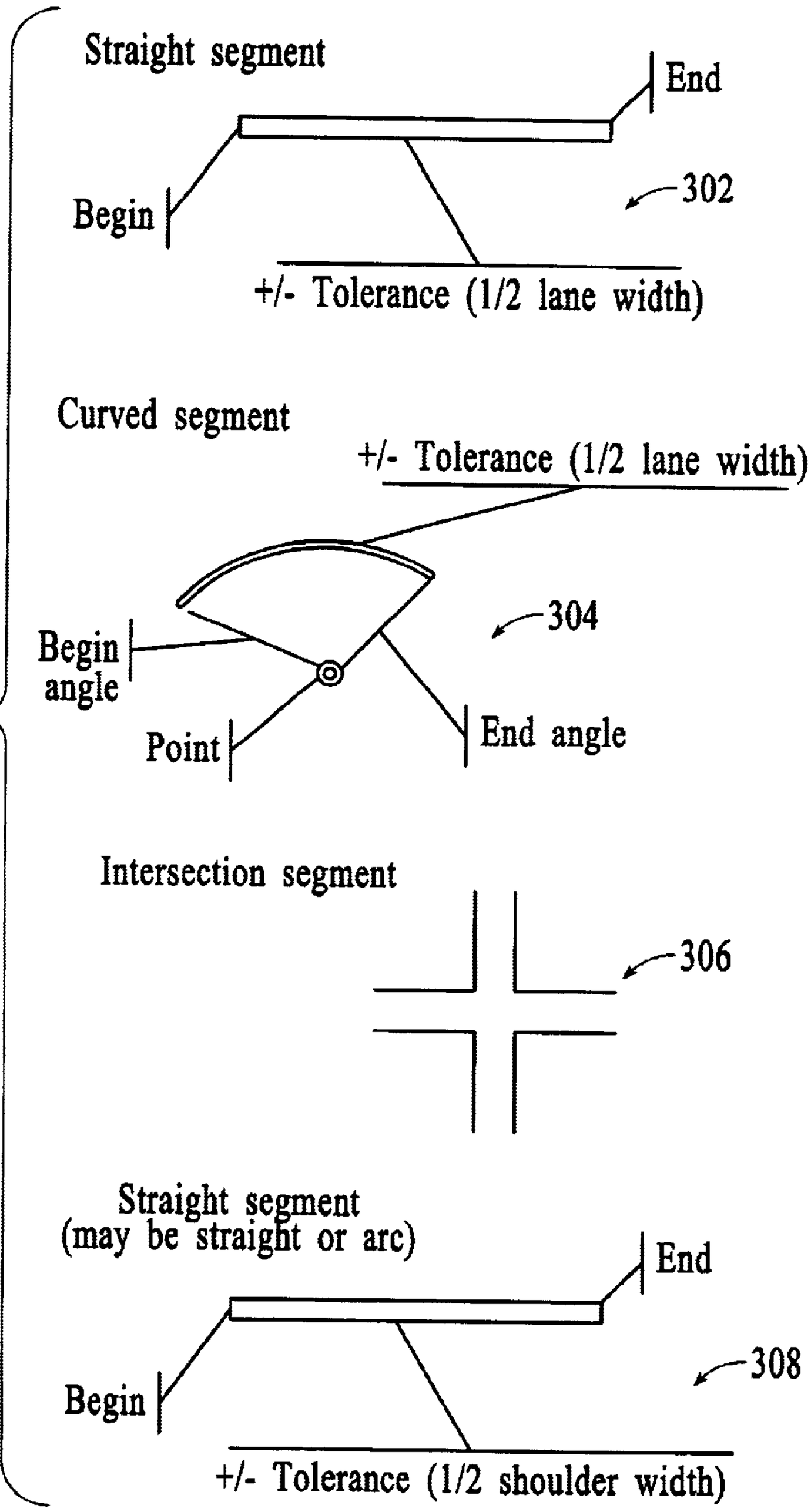

202
Vehicle Object
204
Operator Object
206
Trip Object
208
Segment Object
200

FIG. 2

FIG. 3


Straight segment
End
302
Begin
+/- Tolerance (1/2 lane width)
Curved segment
+/- Tolerance (1/2 lane width)
304
Begin angle
Point
End angle
Intersection segment
306
Straight segment (may be straight or arc)
End
308
Begin
+/- Tolerance (1/2 shoulder width)

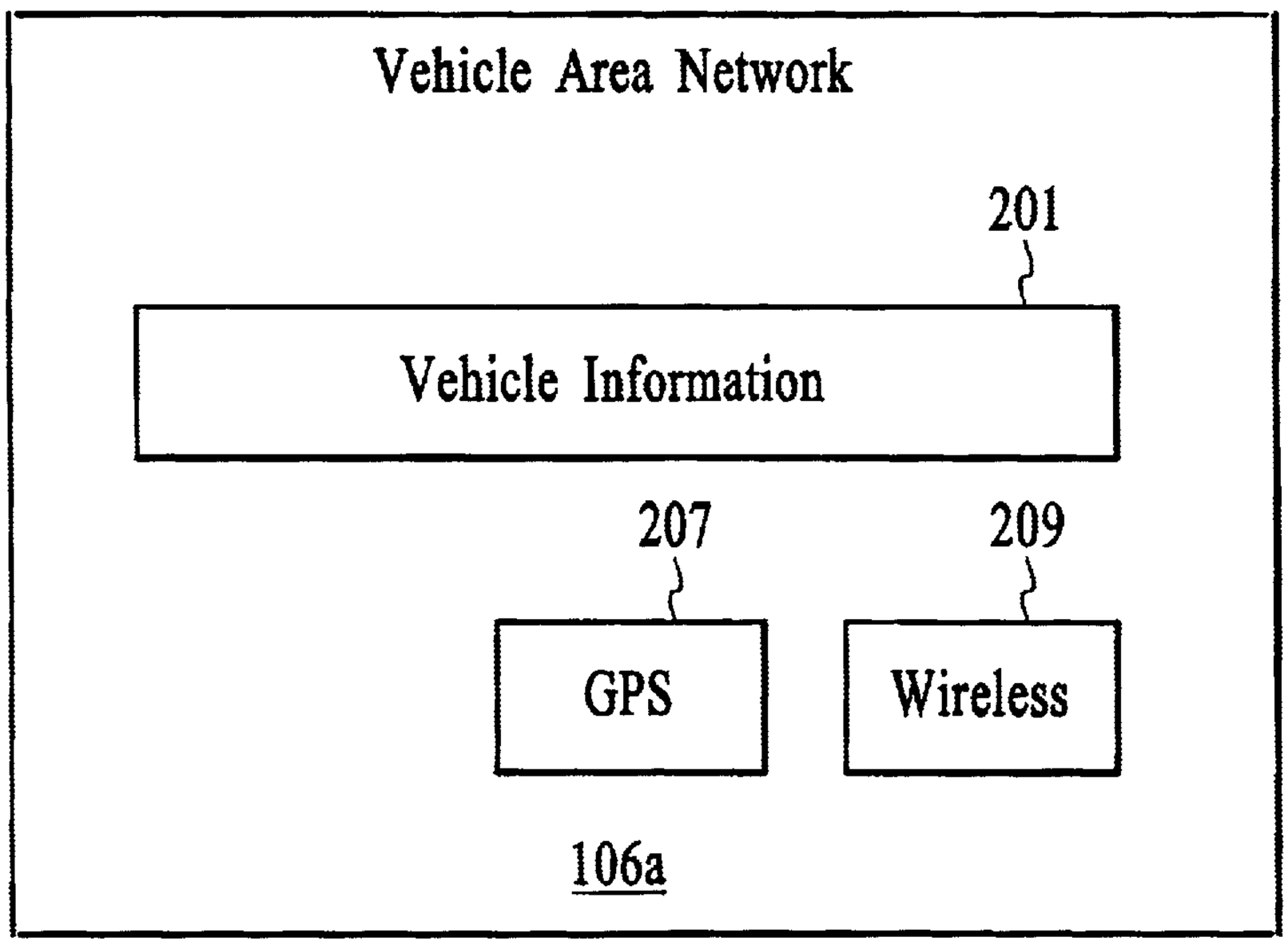

Vehicle Area Network
201
Vehicle Information
207
GPS
209
Wireless
106a

FIG. 4

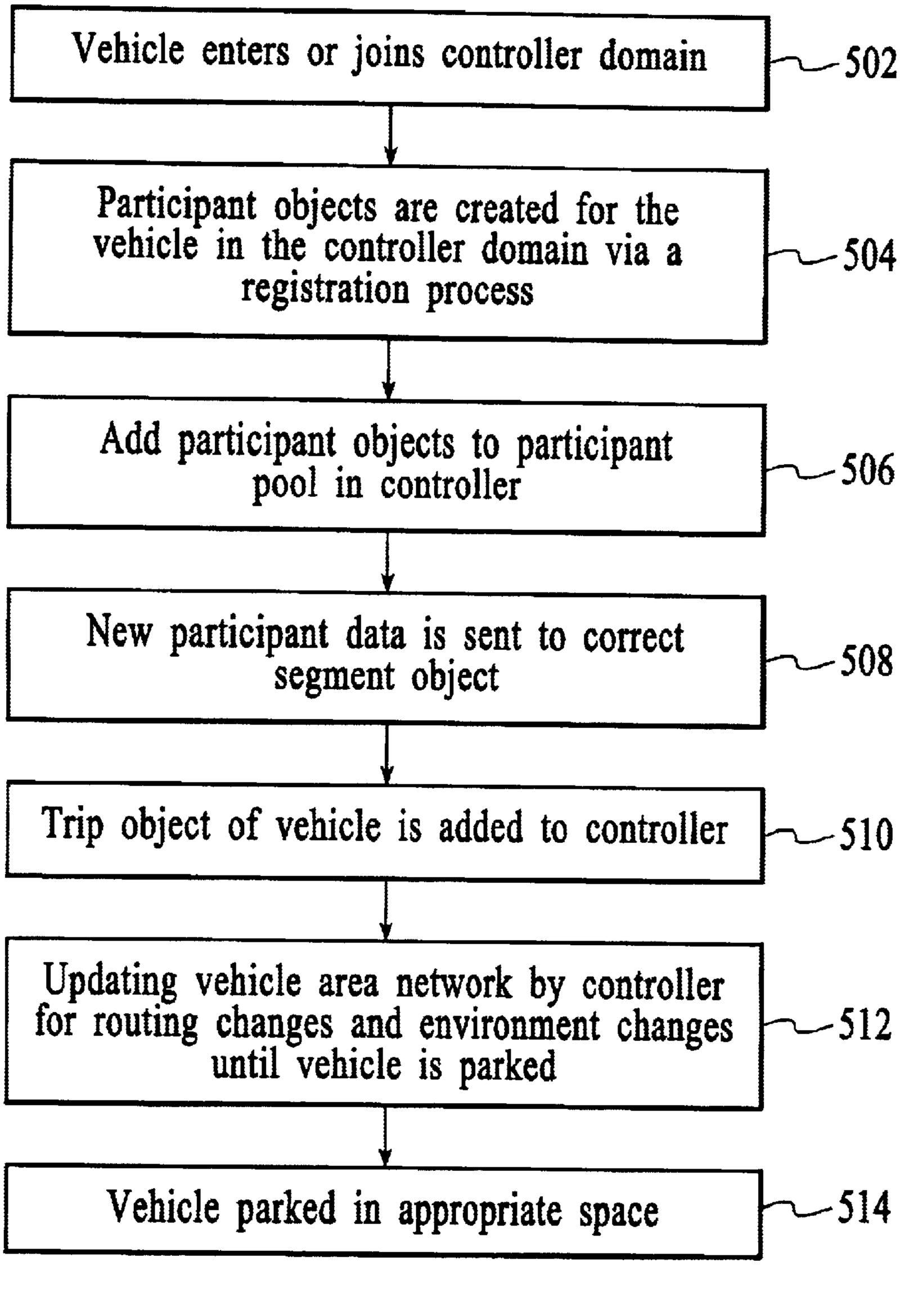

Vehicle enters or joins controller domain
502
Participant objects are created for the vehicle in the controller domain via a registration process
504
Add participant objects to participant pool in controller
506
New participant data is sent to correct segment object
508
Trip object of vehicle is added to controller
510
Updating vehicle area network by controller for routing changes and environment changes until vehicle is parked
512
Vehicle parked in appropriate space
514

FIG. 5

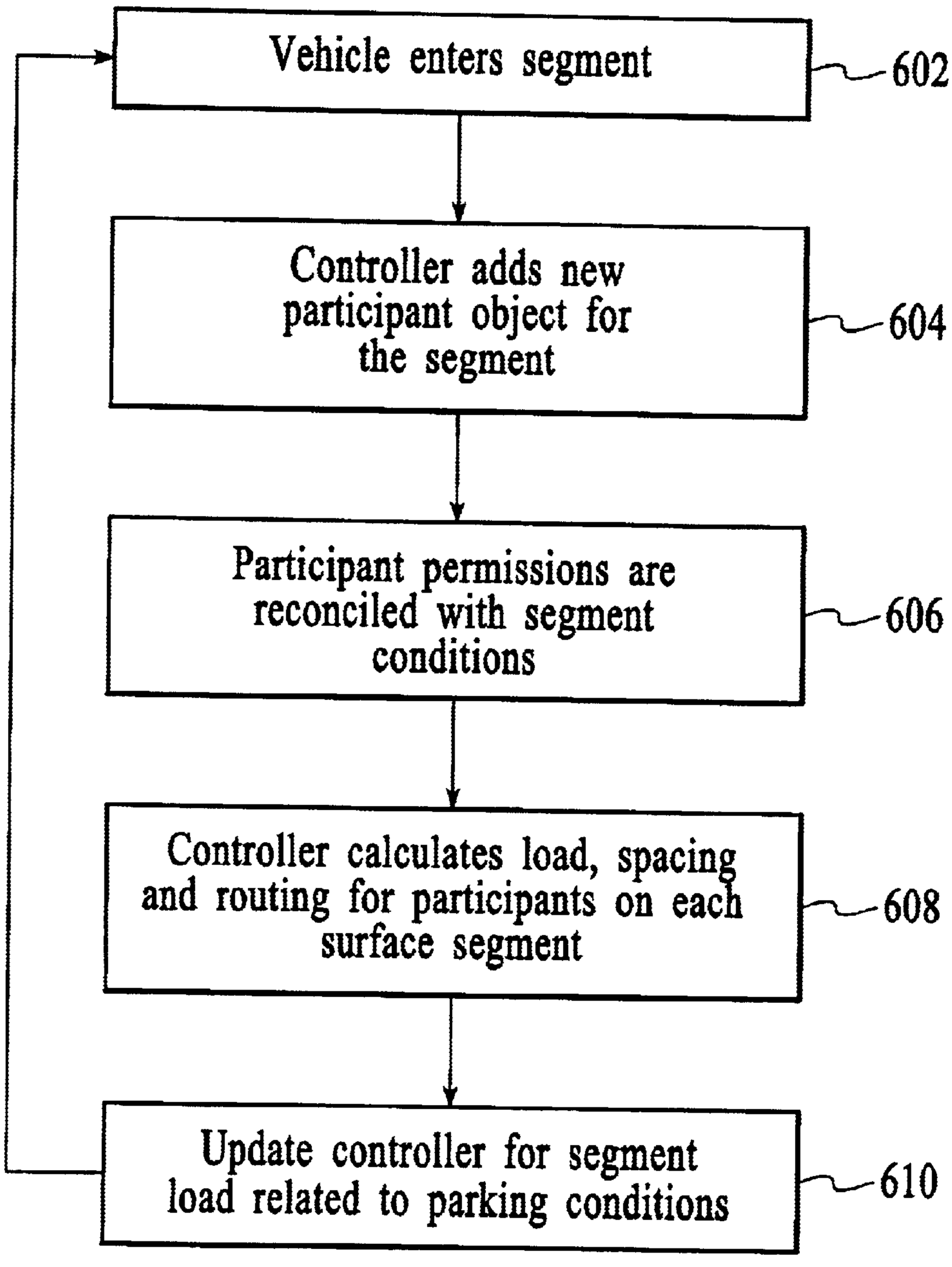

Vehicle enters segment
602
Controller adds new participant object for the segment
604
Participant permissions are reconciled with segment conditions
606
Controller calculates load, spacing and routing for participants on each surface segment
608
Update controller for segment load related to parking conditions
610

FIG. 6

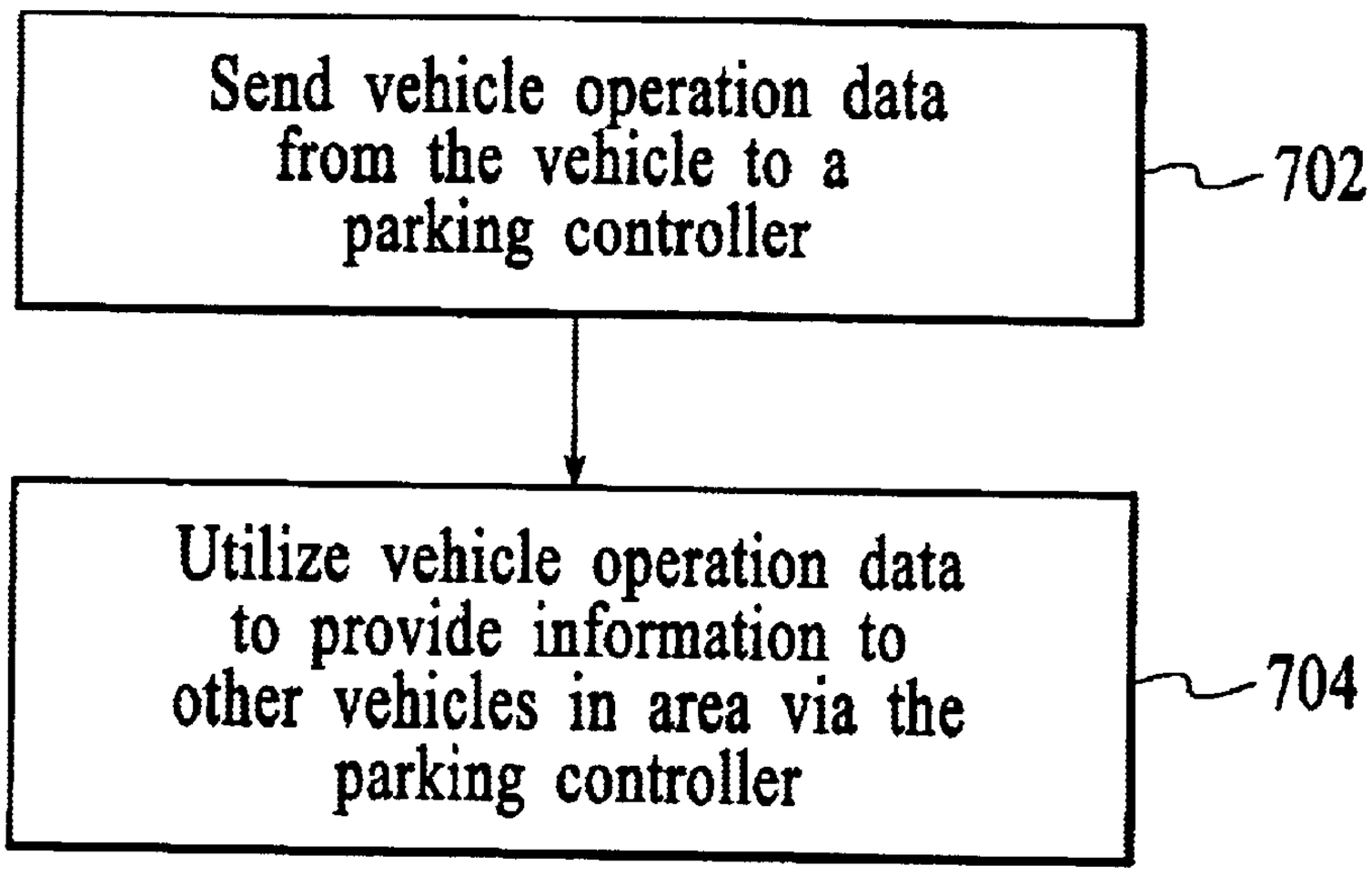

Send vehicle operation data from the vehicle to a parking controller
702
Utilize vehicle operation data to provide information to other vehicles in area via the parking controller
704

FIG. 7

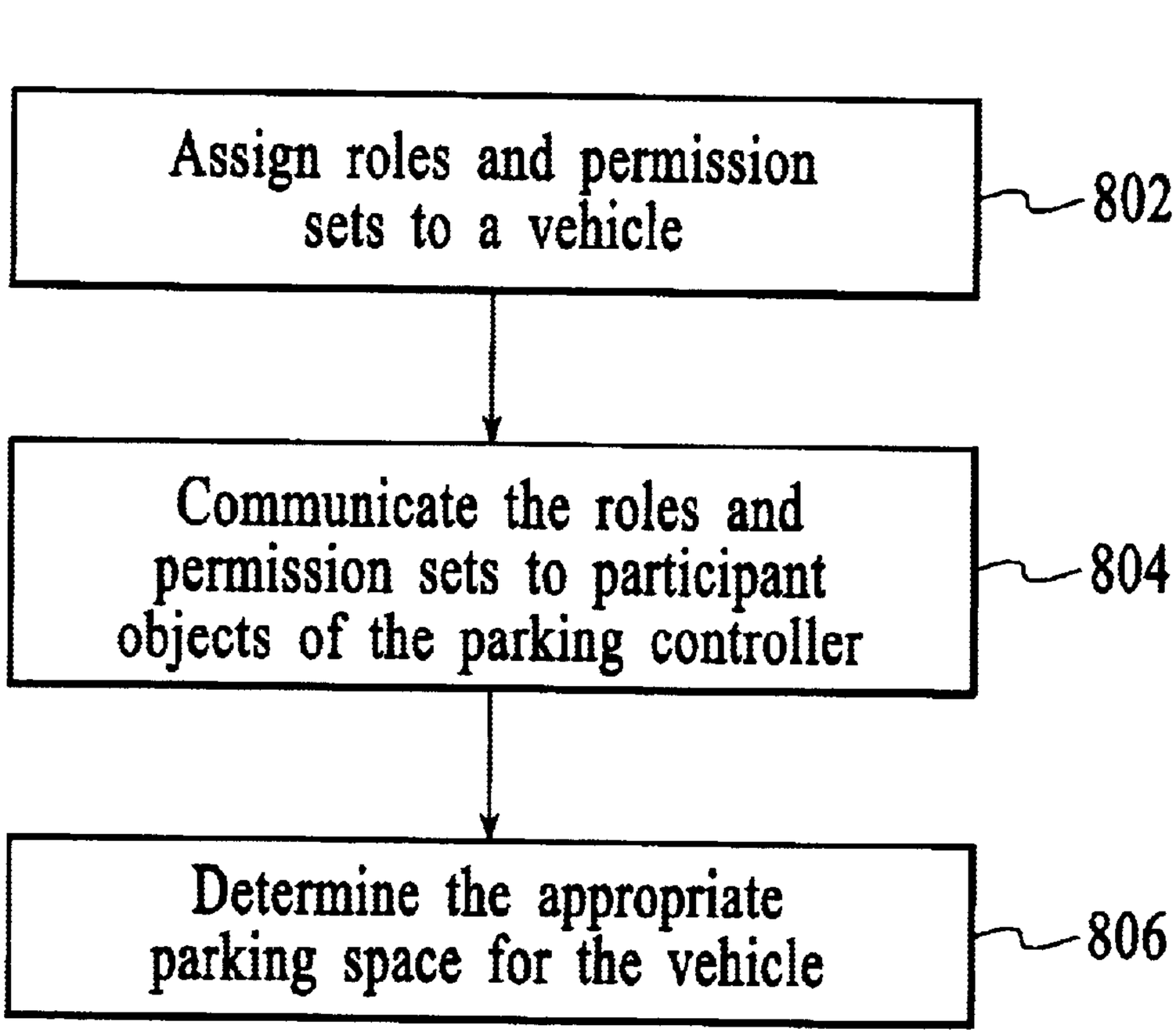

Assign roles and permission sets to a vehicle
802
Communicate the roles and permission sets to participant objects of the parking controller
804
Determine the appropriate parking space for the vehicle
806

FIG. 8

SYSTEM AND METHOD FOR AUTOMATED PARKING

FIELD OF THE INVENTION

The present invention relates generally to the parking of vehicles and more particularly to the automated parking thereof.

BACKGROUND OF THE INVENTION

Commercial environments typically include parking lots to allow for customers or employees or visitors or the like to park their vehicles. In some locations, as parking becomes very difficult and there are, for example, areas designated for handicapped individuals or the executives within the company or some other way of insuring that an individual obtains parking. However, there are many environments where it is impossible to tell whether there are parking spaces except for the blanket "no parking" sign at the entrance of the parking lot, for example.

Accordingly, oftentimes individuals driving a vehicle may have to search for a parking spot in the parking structure. A good example of this is when parking at an airport, airport short term or long term parking, where during the holiday season it may be very busy and the parking lot is virtually full and the occupant of the vehicle can not adequately ascertain whether a space is available. Another example is in a shopping mall area where there is limited parking in a parking structure and the user of a vehicle must search for a parking space. This can be time consuming and tedious.

Accordingly, what is desired is a system and method for allowing an occupant of a vehicle to be able to quickly and accurately park in a structure. The system must be easy to operate, must be compatible with existing systems and must be cost effective. The present invention addresses such a need.

SUMMARY OF THE INVENTION

A parking control system is disclosed. The parking control system comprises a plurality of vehicles. A portion of the plurality of vehicles occupies parking spaces in a parking lot. At least one of the vehicles is attempting to park in a parking space of the parking lot. At least one of the plurality of vehicles is capable of a two-way communication. The parking control system also includes a parking controller. The parking controller receives and provides information to the plurality of vehicles. The parking controller can communicate the most appropriate parking space to the vehicle that is attempting to park.

In a method and system in accordance with the present invention, a parking controller monitors a parking lot and can be in direct contact with the vehicles. The parking controller receives and transmits information to and from the vehicles and allows for an overall view of the parking lot to be understood. Accordingly, through the use of the parking controller system, parking is controlled more accurately and automatically.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a parking control system in accordance with the present invention.

FIG. **2** illustrates a vehicle utilized with the system in accordance with the present invention.

FIG. **3** illustrates the use of roles and permissions in a parking control system.

FIG. **4** illustrates a vehicle utilized within the system in accordance with the present invention.

FIG. **5** is a flowchart illustrating operation of a controller when receiving information from and providing information to a vehicle.

FIG. **6** is a flowchart illustrating the use of a segment object when vehicles are traveling through a segment associated with the segment object.

FIG. **7** is a flowchart illustrating a vehicle providing information to a controller within traffic control system.

FIG. **8** illustrates the use of roles and permission in a parking control system.

DETAILED DESCRIPTION

The present invention relates generally to the parking of vehicles and more particularly to the automated parking thereof. The following description is presented to enable one of ordinary skill in the art to make and use the invention and is provided in the context of a patent application and its requirements. Various modifications to the preferred embodiment and the generic principles and features described herein will be readily apparent to those skilled in the art. Thus, the present invention is not intended to be limited to the embodiment shown but is to be accorded the widest scope consistent with the principles and features described herein.

FIG. **1** is a block diagram of a parking control system **100** in accordance with the present invention. The parking control system **100** could be part of a traffic control system, such as that described in co-pending patent application Ser. No. 09/964,933, entitled Hierarchical Traffic Control System, filed on Sep. 27, 2001, and assigned to the assignee of the present application, or the parking control system **100** could be a stand-alone system. The parking control system **100** comprises a parking controller **104** that determines where the parking spaces are within the parking lot. In this system as is seen there are a plurality of vehicles **106** occupying the parking spaces of the parking lot. In this embodiment there are two empty parking spaces **109**. A vehicle **106***a* upon entering the parking lot can communicate information about its size, length, width, etc., to the parking controller, and the parking controller **104** will then indicate to the vehicle **106***a* the most appropriate parking space **109** based upon input from the parking controller **104**.

The parking controller **104** could be automated or an individual could be located therewithin. For example, in an automated system, a computer could be optimizing parking in the parking lot. On the other hand, a human could be located within a parking controller **104** to ensure that the parking is optimized within the parking lot.

The parking controller **104** typically includes a server system **107** that is tracking each vehicle **106** within the parking lot. The server system **107** includes a predictive system which can calculate where a vehicle **106** is moving and how quickly it will reach its destination. Within the server system **107** is a database which is object oriented. That is, each of the databases includes a plurality of participant objects. These participant objects are utilized by the controller **104** to manage the operation of vehicles within the system.

FIG. **2** illustrates the plurality of participant objects in a participant pool **200**. The participant pool **200** is within the database of the server within the controller. A participant object has three primary elements which interact and influence its behavior. One is the physical object being

represented, a second is an operator who can manipulate or direct the object, and the third trip plan, in the case of mobile objects. In a preferred embodiment, objects that are available are a vehicle object **202**, an operator object **204**, a trip object **206**, and a segment object **208**. The functions and features of each of these objects are described in detail hereinbelow

Vehicle Object **202**

A vehicle object **202** typically includes the make, model and capabilities and limitations of the vehicle. For example, it would include the height, weight, maximum speed and the like.

Operator Object **204**

An operator object **204** typically includes information about the operator. It would typically include height, weight, and age information. The operator object would also include the class of drivers license (i.e., learner's permit, limousine permit, etc.) and any capabilities, features or limitations of the operator.

Trip Object **206**

A trip object **206** indicates the trip plan of the vehicle. The trip object **206** could come from a preplanned trip information, such as a trip to work or a vacation. The trip object **206** could be related to historical information, once again, repeated trips to work, for groceries or to a relative. Finally, the trip object **206** can be created such as from a current location to home.

Segment Object **208**

A segment object indicates information about a segment of the road within the controller's domain. FIG. **3** illustrates a plurality of segment objects within the parking lot in accordance with the present invention. The plurality of segment objects in a preferred embodiment include a straight segment object **302**, a curve segment object **304**, an intersection segment object **306** and shoulder intersection object **308**. A straight segment object **302** has a beginning and an ending point, and for example, directionality from beginning to end may denote one direction and flags may, for example, denote that there is a two-way flow. In a preferred embodiment, the tolerance may be ±½ lane width to allow a particular vehicle to have the right of way therein. A curve segment object **304** has a begin angle, an end angle, and a point which denotes both of those angles. An intersection segment object **306** provides an array of ports which denote the entrances and exits to an intersection within the parking lot. A shoulder segment object **308** may be straight or an arc, may be a description of a surface like a drop-off and facilities like emergency telephones to allow for parking control.

The parking controller is computationally intensive due to the large number of objects and the large amount of information within each object. For example, on a parking lot, there may be several lanes, spaces and turns which are represented by segment objects, turn offs, shoulders, all of which are represented by segment objects, several vehicles of various sizes and classes, further represented by various participant objects. Accordingly, the parking controller could be implemented by supercomputers, by distributed processors or other compiling architectures to represent the participant objects in an effective and efficient manner.

Referring back to FIG. **1**, the parking controller **104** can appropriately suggest a parking space for a vehicle based upon the controller's **104** determination of the vehicle's status based upon the participant objects associated with the particular vehicle. The controller **104** can appropriately indicate to a vehicle that a space is available based upon roles and permissions of the vehicle **106**.

One of the features of the present invention is that a vehicle **106** can provide feedback to the parking controller **104**. A vehicle **106** may automatically provide information about its condition by sending vehicle operation information. For example, the server system **107** within the controller **104** can receive information concerning whether a particular vehicle **106** can be parked in a handicapped area and the like. Commercial institutions can use vehicle permissions to their benefit by providing permissions to individual parking spaces—best customers park near the door. Parking lot operators can charge extra for premium spaces—not just premium lots by setting the permissions at the entry into the parking facility. The system can be utilized such that large vehicles can not have permission to park in compact slots. Parking for the handicapped can be enforced. For example, GPS and two-way communications can alert the driver of a violation and alert the parking police. Through the use of this system, the parking controller **104** can monitor the vehicles that enter the area and based on up-to-the minute data from other vehicles within the system can indicate where the vehicle should park.

FIG. **4** illustrates a vehicle **106***a* utilized within the system **100** in accordance with the present invention. Typically, an enabled vehicle **106***a* will include a vehicle area network that allows for the vehicle and its occupants to communicate with the parking controller **104**. In this embodiment, the vehicle **106***a* includes a vehicle information system **201** that provides length, width, weight, etc. Although this particular vehicle information system **201** is shown in the vehicle area network, one of ordinary skill in the art recognizes there are a variety of other conditions or systems, that can be monitored and their use would be within the spirit and scope of the present invention.

The vehicle **106***a* also includes wireless communications **209** and a global positioning system (GPS) location apparatus **207** therewithin. The wireless communications **209** allow for two-way communication between the vehicle **106***a* and the parking controller **104**. The GPS location system **207** could be used in a variety of fashions. For example, the GPS location system can be within a vehicle, or triangulation on a cell phone or some other wireless scheme.

Accordingly, the occupant of the vehicles **106***a* can communicate with the parking controller **104** directly to ensure that specific issues are addressed via voice communication. In addition, the location of a vehicle **106** in a parking lot can be tracked using the GPS location system **210**.

One of the features of the present invention is that a vehicle can provide feedback to the parking controller **104**. A vehicle may automatically provide information about its condition by sending vehicle operation information. This vehicle information is added to the vehicle object within the controller. For example, the database within the controller can send information to the vehicle about the parking spaces for that particular vehicle upon entrance into the parking lot. The vehicle upon entering can provide vehicle information to the vehicle object of the database and the controller can provide information as to the particular parking spaces that will accommodate the vehicle based upon the vehicle's size, weight, permissions, etc.

Information about the vehicle and segments is utilized by the controller to effectively route vehicles to appropriate parking spaces. To more specifically describe their interaction, refer now to the following description in conjunction with the accompanying figures. These interactions will be described from different viewpoints. FIG. **5** is a flow chart illustrating operation of a controller when receiving information from and providing information to a vehicle.

FIG. **6** is a flow chart illustrating the use of a segment object when vehicles are traveling through a segment associated with the segment object.

FIG. **5** illustrates a controller interaction with the vehicle and the segments. First, a vehicle enters or joins a controller domain, via step **502**. The vehicle area network when it enters the controller domain provides a plurality of information to the database of the controller as above described. Initially, participant objects are created for the vehicle in the controller domain via a registration process, via step **504**. These participant objects are then added to the participant pool in the controller, via step **506**. The new participant data is then sent to the correct segment object within the controller, via step **508**, so that the particular segment object has information within it relating to all the vehicles within that particular segment. In addition, a trip object vehicle is added to the controller, via step **510**. Thereafter the vehicle area network is updated by the controller for routing changes, environment changes within the segment, via step **512**. This updating step **512** continues until the vehicle is parked in the appropriate space, via step **514**. As can be seen, the vehicle area network, the segment objects and the controller interact to allow for a vehicle to effectively traverse a domain of the parking controller.

To describe the use of the segment object when vehicles are traveling through a segment associated with that segment object, refer now to the following. Referring now to FIG. **6**, first a vehicle moves into a new segment, via step **602**. Next, a controller adds the new participant object for this segment, via step **604**. The controller then determines the number of participants in the segment, the permissions that each participant within the segment has and reconciles that for segment conditions to provide for appropriate parking, via step **606**. The controller then calculates the load spacing and routing for participants of each surface segment, via step **608**. Thereby, the controller can manage the vehicle within the particular segment for parking and can provide information to vehicles within the segment about whether that particular segment is a good place to find adequate parking. Finally, the controller is updated for segment load conditions related to parking, via step **610**. This process **602–610** is repeated for each vehicle and as each vehicle comes into and leaves the particular segments that they are associated therewith. The vehicles within the various segments, that is, shoulder, curve, intersection, etc., segments, could interact in a variety of ways under the control of the controllers based on traffic conditions, weather conditions, and any other factors which could influence the parking within the parking lot.

Accordingly, data from the vehicle area network can be utilized by parking control system **102** to provide information concerning parking conditions. To describe this feature in more detail, refer now to the following discussion in conjunction with the accompanying figure. FIG. **7** is a flowchart illustrating a vehicle providing information to a controller within the traffic control system. First, data concerning vehicle operation is provided from the vehicle to the parking controller, via step **702**. Thereafter, the parking controller provides the vehicle operation data to a vehicle object within its database. The controller utilizes the vehicle object to provide information to other vehicles in the area concerning parking, via step **704**.

In a first embodiment, an anti-lock braking system passes skid data to a controller in the vehicle. The vehicle area network within the vehicle passes the data along with GPS location data to the controller. The controller analyzes the skid data for a plurality of vehicles, which are at that location to determine if there is a problem at the particular location and adds that information to the vehicle object.

In a second embodiment, a suspension system of the vehicle can be monitored by the vehicle. The data from the suspension system can be forwarded to the vehicle area network within the vehicle. The vehicle area network passes the suspension information along with the GPS location data to the parking controller. The controller then adds that information to the vehicle object. The subsidiary controller analyzes the suspension data from a plurality of vehicles passing through that GPS location and determines if the parking lot has potholes, obstructions and the like, that may impede parking.

Parking Control Based upon Roles and Permissions

The use of roles and permissions of a vehicle can be used by the parking control system **100** to control parking in the parking lot. FIG. **8** illustrates the use of roles and permissions in a parking control system. First, roles and permissions are assigned to a vehicle, via step **802**. Next, the roles and permissions are communicated to the participant objects of the parking controller, via step **804**. Then the parking controller communicates the most appropriate parking space based upon the roles and permissions of the vehicle, via step **306**. In a preferred embodiment, the vehicle can communicate information through its vehicle area network to the parking controller.

Vehicles may have different roles and permissions based upon a specific circumstance, their use or other factors, or roles and permissions can be made changeable based upon circumstances. Hence, for example, a police car will have a different role and permissions for parking when a crime is being investigated. Likewise, a fire truck or emergency vehicle may have different roles and permissions for parking dependent upon the circumstances. In addition, the permissions could be upgraded en route based upon the vehicle operator information, GPS information and the wireless communication.

With GPS, two-way communications and car instrumentation for salient characteristics such as size and weight, a particular vehicle can negotiate a permission set for a particular parking lot. A system and method in accordance with the present invention uses the combination of a GPS location with two-way communication between a parking controller and a specific vehicle.

In a method and system in accordance with the present invention, a parking controller monitors a parking lot and can be in direct contact with the vehicles. The parking controller receives and transmits information to and from the vehicles and allows for an overall view of the parking lot to be understood. Accordingly, through the use of the parking controller system, parking is controlled more accurately and automatically.

Although the present invention has been described in accordance with the embodiments shown, one of ordinary skill in the art will readily recognize that there could be variations to the embodiments and those variations would be within the spirit and scope of the present invention. Accordingly, many modifications may be made by one of ordinary skill in the art without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A parking control system comprising:

a plurality of vehicles, a portion of the plurality of vehicles occupying parking spaces in a parking lot; at least one of the vehicles attempting to park in a parking space of the parking lot; the at least one of the plurality of vehicles being capable of a two-way communication; and

a parking controller, the parking controller for receiving information from and providing information to the plurality of vehicles, wherein the parking controller can communicate the most appropriate parking space to the at least one vehicle, wherein the communications to the parking controller include roles and permissions which have been assigned to the vehicle, and wherein if the roles and permissions are violated, an appropriate action is taken by the parking control system.

2. The parking control system of claim **1** wherein the vehicle automatically sends information to the parking controller concerning location and vehicle information.

3. The parking control system of claim **2** wherein the vehicle includes a GPS location system, a voice communication system, and at least one vehicle operation system, wherein information concerning the vehicle operation can be communicated from any combination of the GPS location, the voice communication system and the vehicle information system.

4. The parking control system of claim **1** wherein the appropriate action could be any combination of rendering the at least one vehicle inoperative, notifying an agency or notifying an entity responsible for the at least one vehicle.

5. The parking control system of claim **1**, wherein the parking controller determines the most appropriate parking space based at least in part on the communicated roles and permissions.

6. The parking control system of claim **5**, wherein one of a plurality of different sets of roles and permissions is assigned to a vehicle based on current circumstances.

7. A The parking control system of claim **6**, wherein the different sets of roles and permissions based on current circumstances include one set of roles and permissions that is assigned when a crime is being investigated, and another set of roles and permissions that is assigned when a crime is not being investigated.

8. The parking control system of claim **5**, wherein different vehicles may have different roles and permissions from each other.

9. The parking control system of claim **8**, wherein the different roles and permissions assigned to different vehicles is based on the use of the vehicle.

10. The parking control system of claim **9**, wherein the use of the vehicle includes emergency services or law enforcement.

11. The parking control system of claim **8**, wherein the different roles and permissions assigned to different vehicles is based on at least one characteristic of each vehicle.

12. The parking control system of claim **11** wherein the at least one characteristic includes the size of the vehicle, such that vehicles over a predetermined size do not have permission to park in parking spaces designated for compact vehicles.

13. The parking control system of claim **8** wherein the vehicle may park in a handicapped parking space designated for handicapped vehicle users if the vehicle has a permission to park in the handicapped parking space.

14. A method for controlling a vehicle by a parking control system, the method comprising the steps of:

(a) assigning roles and permission sets to the vehicle;

(b) communicating the roles and permission sets to the parking control system; and

(c) determining an appropriate parking space for the vehicle based upon the roles and permission sets, wherein if the roles and permissions sets are violated an appropriate action is taken by the parking control system.

15. The method of claim **14** wherein the roles and permission sets are changeable based upon circumstances.

16. The method of claim **14** wherein the vehicle includes a GPS locationsystem, a wireless communication system, and a vehicle information system, wherein information concerning the vehicle can be communicated from any combination of the GPS location, the voice communication system and the vehicle information system.

17. The method of claim **16** wherein the vehicle can negotiate a permission based upon the GPS location system, the at least one vehicle operation system and the wireless communication system.

18. The method of claim **14** wherein the appropriate action could be any combination of rendering the at least one vehicle inoperative, notifying an agency or notifying an entity responsible for the at least one vehicle.

19. The method of claim **14**, wherein one of a plurality of different sets of rolesand permissions is assigned to the vehicle based on current circumstances.

20. The method of claim **19**, wherein the different sets of roles and permissions include one set of roles and permissions assigned when a crime is being investigated, and another set of roles and permissions assigned when a crime is not being investigated.

21. The method of claim **14**, wherein different vehicles may have different roles and permissions from each other.

22. The method of claim **21**, wherein the different roles and permissions assigned to different vehicles is based on the use of the vehicle.

23. The method of claim **22**, wherein the use of the vehicle includes emergency services or law enforcement.

24. The method of claim **22**, wherein the different roles and permissions assigned to different vehicles is based on at least one characteristic of each vehicle.

25. The method of claim **24** wherein the at least one characteristic includes the size of the vehicle, such that vehicles over a predetermined size do not have permission to park in parking spaces designated for compact vehicles.

26. The method of claim **21** wherein the vehicle may park in a handicapped parking space designated for handicapped vehicle users if the vehicle has a permission to park in the handicapped parking space.

27. A parking control system comprising:

a plurality of vehicles, a portion of the plurality of vehicles occupying parking spaces in a parking lot; at least one of the vehicles attempting to park in a parking space of the parking lot; the at least one of the plurality of vehicles being capable of a two-way communication; and

a parking controller, the parking controller including a plurality of participant objects, the parking controller for receiving and providing information to the plurality of vehicles, via at least one of the plurality participant objects, wherein the parking controller can communicate the most appropriate parking space to the at least one vehicle, wherein the communications to the parking controller includes roles and permissions which have been assigned to the at least one vehicle and wherein if the roles and permissions are violated an appropriate action is taken by the parking control system.

28. The parking control system of claim **27** wherein the vehicle automatically sends information to a participant object of the parking controller concerning location and vehicle information.

29. The parking control system of claim **28** wherein the vehicle includes a GPS location system, a voice communi-

cation system, and at least one vehicle operation system, wherein information concerning the vehicle operation can be communicated from any combination of the GPS location, the voice communication system and the vehicle information system.

30. The parking control system of claim **27** wherein the appropriate action could be any combination of rendering the at least one vehicle inoperative, notifying an agency or notifying an entity responsible for the at least one vehicle.

31. A method for controlling a vehicle by a parking control system, the method comprising the steps of:

(a) assigning roles and permission sets to the vehicle;

(b) communicating the roles and permission sets to a participant object of the parking control system; and

(c) determining an appropriate parking space for the vehicle based upon the roles and permission sets, wherein if the roles and permissions sets are violated an appropriate action is taken by the parking control system.

32. The method of claim **31** wherein the roles and permission sets within the participant object are changeable based upon circumstances.

33. The method of claim **31** wherein the vehicle includes a GPS location system, a wireless communication system, and a vehicle information system, wherein information concerning the vehicle can be communicated from any combination of the GPS location, the voice communication system and the vehicle information system.

34. The method of claim **33** wherein the vehicle can negotiate a permission based upon the GPS location system, the at least one vehicle operation system and the wireless communication system.

35. The method of claim **31** wherein the appropriate action could be any combination of rendering the at least one vehicle inoperative, notifying an agency or notifying an entity responsible for the at least one vehicle.

36. A computer readable medium containing program instructions for controlling a vehicle by a parking control system, the program instructions for:

(a) assigning roles and permission sets to the vehicle;

(b) communicating the roles and permission sets to the parking control system; and

(c) determining an appropriate parking space for the vehicle based upon the roles and permission sets, wherein if the roles and permissions sets are violated an appropriate action is taken by the parking control system.

37. A parking control system comprising:

a plurality of vehicles, a portion of the plurality of vehicles occupying parking spaces in a parking lot; at least one of the vehicles attempting to park in a parking space of the parking lot; the at least one of the plurality of vehicles being capable of a two-way communication; and

a parking controller, the parking controller for receiving and providing information to the plurality of vehicles, wherein the parking controller can communicate the most appropriate parking space to the at least one vehicle, wherein the communications to the parking controller from the vehicle includes roles and permissions assigned to the vehicle and wherein if the permission is violated an appropriate action is taken by the parking control system, wherein the roles and permissions set of the at least one vehicle is changeable based upon a specific circumstance.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,646,568 B2
DATED : November 11, 2003
INVENTOR(S) : MacPhail et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 7,
Line 31, delete "A".

Signed and Sealed this

Tenth Day of August, 2004

JON W. DUDAS
Acting Director of the United States Patent and Trademark Office